PMRF-ISSS Teaching Programme

Prime Minister Research Fellowship students' teaching requirement facilitated by the Institute of Smart Structures and Systems

Module PMRF-ISSS082/2024

Applied Optimization for Signal Processing & Communications

Name of the PMRF student

Yashvanth L. (IISc Bangalore)

Required background of the students taught

Electrical, Electronics & Communications

Related optimization prerequisites will be dealt with at the beginning of the course.

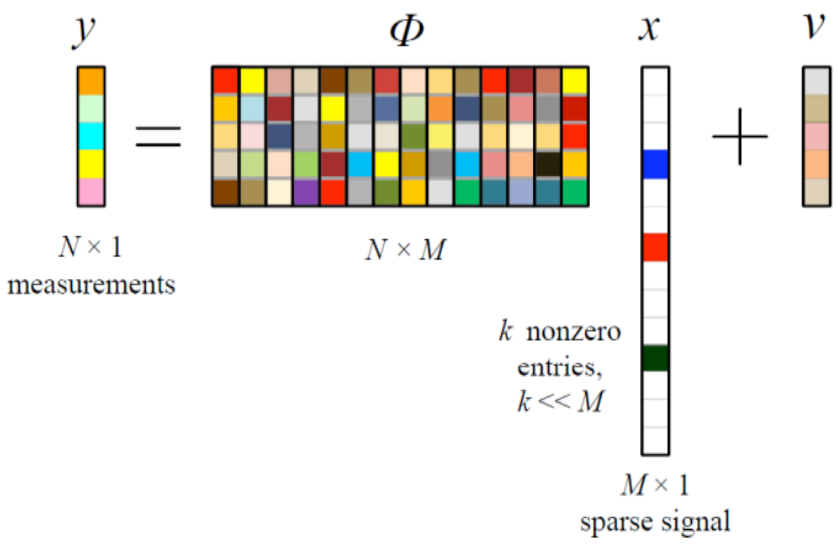

Fig: Sparse recovery problem
(Source: Google images)

Details of the content of the module

MODULE – 1: Theory (Pre-requisites)

a. Optimality conditions: Lagrange, KKT theorems.

b. Convex optimization principles.

MODULE – 2: Applications

a. Array signal processing algorithms: Delay-sum, Capon-MVDR beamformers, DoA estimation techniques, target sensing problems.

b. Compressed sensing and sparse signal recovery: l_0-norm minimization problem, basis pursuit, OMP algorithms, sparse Bayesian learning.

c. Beamforming design in wireless systems: Maximal ratio and zero-forcing precoders, MIMO capacity problem, power control based on "water-filling."

d. Estimation of wireless channels: MMSE criterion, optimal pilot design, and array processing/ compressed sensing for channel estimation.

e. Controlling wireless channel: Design & Optimizing reflecting metasurfaces for SISO, MIMO, OFDM.

Schedule of the module

Starting Date: June 22, 2024

End Date: September 14, 2024 (Tentative)

Class Timing: Recorded Lectures will be uploaded every Saturday @ 6 pm.

Total Lecture hours: 24 hours

Meeting link : Will be shared later

Link

Contact email ID: isss.forum@gmail.com

Registration link:

https://forms.gle/He7Kkjm5EFeCorQt8